TABLE. Summary of Petechial/Purpuric Eruptions Associated With the Application of EMLA Cream in the Literature

Reference	No. Affected Patients/ No. Total Patients	Age	Atopic Dermatitis	Duration of Application	Site of Application	Amount of EMLA Cream Applied
1	2/NP	Children	NP	30 min	NP	NP
8	3/55	3–14 y	Yes	60 min	Groin & axilla	Maximum 10 g
14	3/500	<30 wks GA	NP	90–120 min	Wrists	1/8–1/6 tube*
	1/500	31.5 wks GA	NP	90–120 min	NP	1/8–1/6 tube*
15	1/10	18–25 y	Yes	60 min	Shoulder	NP

Abbreviations: GA, Gestational age; NP, not provided.
* Tube size not specified.

that patients can develop an asymptomatic purpuric eruption, which resolves without sequelae. Premature neonates and patients with atopic dermatitis appear to be at greater risk of developing this purpuric or petechial reaction. Whether future applications of EMLA cream are contraindicated in patients who have had a previous petechial or purpuric reaction is unclear. However, Gourrier et al[14] note that 2 of their 4 patients who had developed a prior purpuric reaction, did not do so when accidentally rechallenged with EMLA cream a few weeks later. Thus far, our patient has not had any additional applications of EMLA cream.

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ADDENDUM

After submitting this manuscript, we witnessed another identical petechial eruption after the application of EMLA cream. Our patient was a 5-year-old white boy with several molluscum lesions on the torso, arms, left thigh, and inguinal region. He had no associated molluscum dermatitis and no known history of atopic dermatitis. In preparation for curettage of these lesions, his mother applied 5 g of EMLA cream occluded with Tegaderm to his left thigh. Approximately 2½ hours later, upon removal of the Tegaderm and EMLA cream, he was noted to have a petechial eruption. Curettage was performed without difficulty and the petechial eruption resolved spontaneously within 1 week. Interestingly, application of EMLA cream to the extremities and torso on two subsequent visits has failed to elicit a petechial/purpuric eruption.

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Fracture-Dislocation of the Lumbar Spine in an Abused Child

ABBREVIATION. SCIWORA, spinal cord injury without observable radiographic abnormality.

Public awareness of child abuse has risen dramatically since Caffey's first description of an association between multiple fractures of the long bones, intraocular bleeding, and chronic subdural hematoma in six infants.[1] Although fractures of the long bones, skull, and ribs attributable to child

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abuse have been well-described,[2-12] few reports specifically address spinal injuries in cases of nonaccidental trauma.[13-18] We report an unusual case of an isolated fracture-dislocation of the lumbar spine with a severe spinal injury as a presentation of child abuse.

CASE REPORT

A 15-month-old white female was transferred to the duPont Hospital for Children (Wilmington, DE) for evaluation of lethargy, facial petechiae, a palpable upper lumbar prominence, and paraplegia. According to the mother, she had noted a "lump" on the child's lower back region approximately 1 week before admission. There was no history of trauma, and the child was otherwise asymptomatic. Evaluation by a covering pediatrician for this included anteroposterior and lateral spinal films at a local emergency room. These films reportedly showed no abnormality, and the child returned home. On the morning of admission, the mother reported that the child had awoken from sleep unable to move her legs. When seen at the transferring hospital, she was noted to be lethargic, with petechiae about the head and neck. She had a palpable prominence in the upper lumbar region and no evident motor or sensory function in the lower extremities. She was afebrile with stable vital signs. The findings were normal for the blood-cell count; coagulation tests; levels of serum glucose, creatinine, sodium chloride, potassium, and blood urea nitrogen. The serum liver function tests and alkaline phosphatase were slightly elevated. The serum amylase level was within normal limits. A computed tomography scan of the head was performed, which showed no abnormality. No additional radiographic studies were obtained. An infectious process was suspected, and the child was administered an intravenous antibiotic. The transferring diagnosis was listed as "rule out spina bifida."

Upon arrival at our hospital, the patient was alert, afebrile, and had stable vital signs. Physical examination was significant for showers of petechiae about the face and neck bilaterally. There was a single round yellow-green ecchymosis at the mid-forehead, measuring 1.5 cm in diameter, as well as a similar ecchymosis at the left buttock, measuring 2.0 cm in diameter. Scant healed lesions consistent with previous varicella infection were diffusely distributed as well. A tender, firm prominence was noted in the region of the upper lumbar spine. There was no fluctuance present, and the surrounding skin was otherwise unremarkable. There was a flaccid paralysis of the lower extremities, with absent deep tendon reflexes, and no demonstrable sensation below the level of the umbilicus. There was a patulous anus, and anal-wink and bulbocavernosus reflexes were absent. There was no physical evidence of sexual abuse. The remainder of the physical examination was unremarkable, including fundoscopic evaluation. Additional laboratory tests revealed an elevated serum creatine phosphokinase of 1260 mU/mL. The urine was light pink in color, with 1–3 red blood cells per high-powered field. Plain films demonstrated a complete fracture-dislocation of the first-on-second lumbar vertebral body, with fracture of the spinous process and superior facets of the second lumbar vertebra (Fig 1). A methylprednisolone protocol was instituted, as the time frame from injury was unknown. Sagittal and axial T1– and T2–weighted magnetic resonance imaging demonstrated the fracture-dislocation to be associated with an extensive soft-tissue hematoma and marked spinal cord compression. An edematous left kidney with hypointense signal to its upper two-thirds consistent with infarction and a distended bladder were noted (Fig 2 and Fig 3). Consultation was made with the orthopedics department, and the patient was subsequently taken to the operating room that same day where a closed reduction under flouroscopic guidance and molded posterior splinting were performed. A skeletal survey was obtained, which showed no evidence of any other osseous injury. General surgery evaluation included Doppler examination of the abdomen, with no evidence of occlusion of the aorta or vena cava.

The following day, the patient was taken back to the operating room for definitive stabilization. The spine was exposed from the twelfth thoracic to third lumbar vertebrae. There was a wide diastasis at the first and second lumbar interspace, and there were comminuted fractures of the spinous process and superior facets of the second lumbar vertebra. Gentle irrigation of clot revealed the dura to be intact, but absent of arterial pulsations. Open

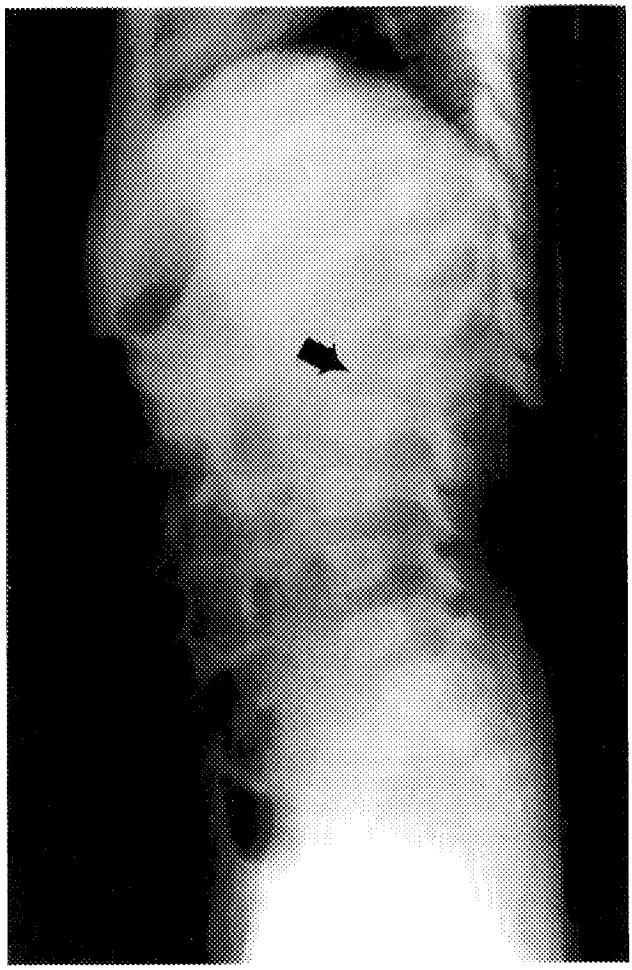

Fig 1. Lateral radiograph demonstrates a complete anterior fracture-dislocation through the L1–L2 interspace (arrow), with fracture of the spinous process and superior facets of L2.

reduction, facetectomies, and posterior spinous process wiring with incorporation of bilateral fibular strut allografts were performed from the twelfth thoracic to third lumbar vertebrae. Immediately postoperatively, the patient was placed back into her molded posterior plaster splint, and returned to the intensive care unit. She was placed in a fiberglass body cast the next day, and was subsequently transferred to the rehabilitation unit.

On further discussion with the mother, it was revealed that she and her husband of 1 year had separated over the previous year, and she began living with a boyfriend over the past several months. Although the child seemed initially comfortable around this man, over the past 4 weeks she had become increasingly unhappy in his presence, crying and carrying on. Subsequent investigation by the authorities led to the arrest and conviction of the boyfriend, who confessed to abusing the child.

After further work-up of the renal infarct and neurogenic bladder, an intermittent catheterization program was instituted. The child was discharged home in the care of her mother. At the time of her 12-month follow-up, she had regained good functional strength in all lower extremity muscle groups except ankle dorsiflexors, which demonstrated fair strength. She was fully ambulatory in articulated ankle-foot orthoses. She had regained control of bowel and bladder function, and was being successfully toilet-trained.

DISCUSSION

Fractures of the spine in children are uncommon, comprising <5% of all reported spinal injuries.[19-24] Spine fractures typically result from high-energy trauma as incurred by passengers in motor vehicles, pedestrians struck by moving vehicles, or falls

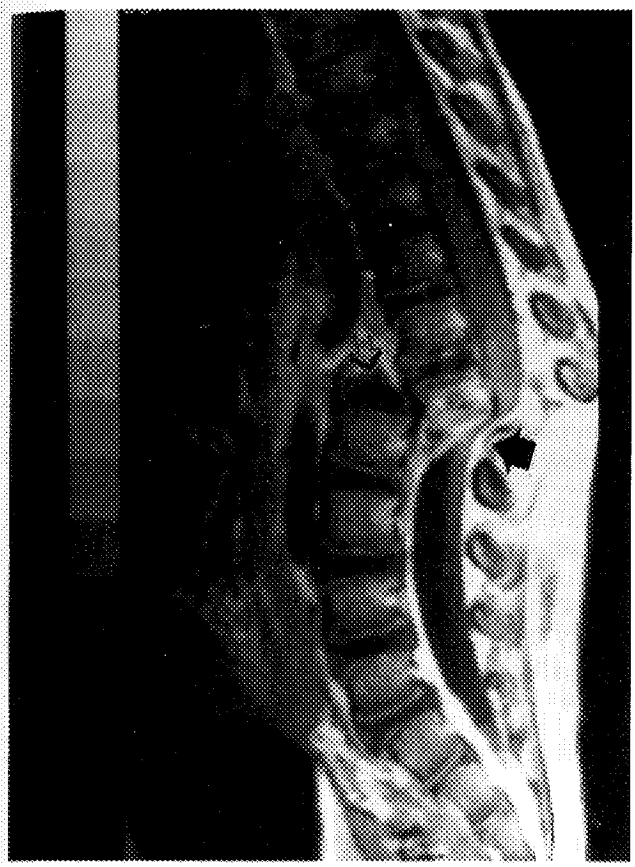

Fig 2. Sagittal T1–weighted magnetic resonance imaging demonstrates the marked spinal cord compression at the level of the fracture-dislocation (solid arrow). The L1–L2 intervertebral disc and the inferior endplate apophysis of L1 have maintained continuity with the body of L2 (open arrow).

from significant heights, and often coexist with other major skeletal and visceral injuries.[23,25–30] Thoracolumbar fracture-dislocation more likely occurs in the older child or adolescent[22–24,27,31] than in younger children, who frequently sustain significant spinal cord injury without observable radiographic abnormality, the so-called "SCIWORA" phenomenon.[20–22,24,26,28,31–33]

Although it has been recognized that spinal fracture can be a manifestation of child abuse, most reports indicate that it is an uncommon and an incidental finding in a much larger spectrum of injuries, which includes visceral injuries and additional fractures.[4,6,7,34] Perhaps the earliest documentation of a spinal fracture in child abuse appears in the series by McHenry et al in 1963, demonstrating a fracture of a vertebral body in a 7-month-old with multiple other fractures in various stages of healing.[35] Swischuk[18] described 7 cases of battered children with spine injury consisting of compression fractures of the thoracic and lumbar spine, as well as 1 patient with a healing fracture-dislocation of the second-on-third lumbar vertebra and concomitant cervical spinal cord injury without radiographic evidence of osseous injury. In all cases, numerous other fractures were noted, and 3 patients had subdural hematomas. All patients were under 2 years of age. Cullen[13] described 5 cases, also under the age of 2 years, 1 with fracture-dislocation of the twelfth thoracic-on-first lumbar vertebra, and 1 with subluxation of the eleventh-on-twelfth thoracic vertebra. Neither of these were isolated injuries. The remaining 3 sustained anterior compression fractures, 1 discovered incidentally during films for pneumonia. Renard et al[36] described 3 unusual cases of spinal cord injury in childhood, 1 involving a subluxation at the thoracolumbar junction with complete paraplegia from a vigorous spanking.

More recently, Dickson and Leatherman[14] described a 2-year, 9-month-old child referred for investigation of a dorsolumbar kyphus and no history of trauma. Lateral radiographs revealed anterior wedging of the twelfth thoracic vertebral body. In addition, multiple rib fractures were evident. A pattern of parental abuse of the child's siblings was later

Fig 3. Axial T1–weighted magnetic resonance imaging demonstrates an edematous left kidney with hypointense signal (large solid arrow). The intervertebral disc and second lumbar vertebra (small solid arrow) are seen anterior to the body of the first lumbar vertebra (open arrow).

disclosed. Kleinman and Zito[16] examined the skeletal surveys and clinical records of 19 abused infants under 5 months of age, finding injuries of the spinous processes in 3 infants (16%). The margins of the processes were irregular, with ill-defined adjacent areas of ossification. Tomograms confirmed the amorphous nature of the ossification, indicating cartilaginous calcification or myositis ossificans. A mechanism of vigorous shaking of the infants was proposed.

In 1995, Piatt and Steinberg[17] described a 15-month-old female infant who was transferred from a community hospital emergency department because of quadriplegia. The infant had received medical attention 2 months earlier for facial burns. Upon presentation, she exhibited a flaccid quadriplegia with complete anesthesia below the neck. There were skin bruises over the medial aspect of both arms, as well as multiple other bruises in various stages of absorption. The patient exhibited showers of petechiae, heaviest about the neck but also noted over both ears, the jaw, upper chest, and right arm. A clinical photo provided in their report demonstrates a strikingly similar appearance to petechial lesions in our patient. Radiographs of the spine were normal, with magnetic resonance imaging of the cervical spine demonstrating fusiform swelling of the spinal cord in the mid-cervical region with hematomyelia. A healed fracture of the right clavicle was noted as well.

Spine fracture as an isolated finding in child abuse without additional fractures of the skeleton is much more rarely documented. Diamond and associates[37] described a 12-month-old child with an isolated thoracolumbar fracture-dislocation from abuse. The absence of concomitant fractures led to a delay in recognition of the traumatic nature of the injury, and the findings on plain films of an anterior spondylolisthesis at the thoracolumbar junction and pedicular widening were interpreted as congenital. The findings of a "raised" area over the middle of the back, lower extremity paraplegia, fever, and red blood cells in fluid obtained from a spinal tap led to a presumed diagnosis of meningitis, and the child was placed on intravenous antibiotics. Computed tomography later revealed bilateral pedicle fractures, confirmed at surgical exploration. Carrion and associates[38] included this child in their report of 2 abused children with isolated spine fractures and paraplegia.

The mechanism of spinal injury in most cases of child abuse remains obscure. It is felt that most of these fractures are related to hyperflexion-hyperextension, either from shaking or direct blows.[39–42] Spinal fracture, however, has not been described as a common finding in the shaken baby syndrome. More characteristically, the syndrome results in subdural and retinal hemorrhages, with pathophysiologic consequences of diffuse cerebral axonal injury.[1,43–52] A recent report by Hadley[22] did demonstrate an upper cervical cord contusion from shaking, and Pang and Wilberger[53] included 1 case of shaken baby syndrome in their report on the SCIWORA phenomenon. Based on the pattern of facial petechiae and ecchymoses below the jaw in their patient, Piatt and Steinberg proposed that the abuser may have grasped the victim by the neck and, in distinction from the more typical mechanism of shaking by the arms, whiplashed the child's body rather than the head.[17] Carrion and associates proposed a mechanism of axial load, flexion, and rotation to explain their findings of separation of the vertebral centrum from the polar growth centers above and below and separation of the posterior elements from the centrum by a fracture running through the neurocentral synchondrosis.[38]

The mechanism of injury in the case reported here remains unknown, but the nature of the spinal injury in the absence of other signs of a direct blow suggests a hyperflexion or hyperextension mechanism. The precise relationship of this to renal infarction and showers of petechiae about the head and neck is obscure, but could be related to a sudden increase in intrathoracic or intraabdominal pressure.

We report this unusual case of an isolated fracture-dislocation of the lumbar spine with severe cord injury as a presenting sign of child abuse. Evaluation of a child with acute spinal pathology requires a detailed history and meticulous physical examination. Nonaccidental trauma must always be considered in the differential diagnosis. The presence of a fever, petechiae, spinal "mass," and neurologic findings in these children may lead to an incorrect diagnosis of spinal meningitis, and to a delay in appropriate treatment. Skeletal survey must be undertaken, and mandates inclusion of anteroposterior and lateral radiographs of the entire spine. Any neurologic findings or symptomatology related to the spine, as well as any abnormality on the screening spine films, should be followed up by physician-controlled oblique and lateral flexion-extension views. Magnetic resonance imaging or computed tomography should be considered in cases of documented spinal pathology.

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Percutaneous Central Venous Catheterization in Premature Infants: A Method for Facilitating Insertion of Silastic Catheters via Peripheral Veins

ABSTRACT. Peripheral venous cannulation is the preferred method of inserting central venous silastic catheters in premature infants. The standard techniques are placement of the catheter using a breakaway introducer needle or introduction of the catheter through a cannula. In extremely low birth weight infants (<1000 g) successful cannulation is impeded by the small size of the vessels. After repeated attempts, both procedures can be time-consuming and stressful to the infant. We present a modified insertion technique of the standard 2-French silastic catheter with an increased success rate, thus reducing insertion time, stress to the infant, and costs. The method uses the tip of a 20-gauge cannula as dilator/introducer for the 2-French catheter. This tip is inserted into the vessel with a standard 24-gauge cannula. After successful insertion of the dilator/introducer cannula, the standard 2-French catheter can then be advanced easily. ***Pediatrics* 1998:101:477–479; *peripheral central venous catheterization, very low birth weight infants, methods.***

Peripheral venous cannulation is the preferred method of inserting central venous silastic catheters in premature infants.[1] The standard techniques are placement of the catheter using a breakaway introducer needle or introduction of the catheter through a cannula.[2] Alternative options are venous cutdown or the Seldinger technique.[2,3] For

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